CLAIMS

1. Process for preparing functionalized polyalkyleneimines, characterized in that a polyalkyleneimine is treated with a functionalized hemiacetal in the presence of titanium (IV) isopropoxide and sodium borohydride.

2. Process for preparing functionalized polyalkyleneimines according to claim 1, characterized in that the process is performed in an alcoholic solvent.

3. Process for preparing functionalized polyalkyleneimines according to claim 2, characterized in that said alcoholic solvent is methanol or ethanol.

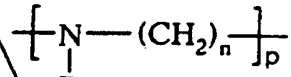
4. Process for preparing functionalized polyalkyleneimines according to claim 1, characterized in that the process is also performed at a temperature of between 10°C and 30°C.

5. Process for preparing functionalized polyalkyleneimines according to claim 1, characterized in that between 25 mol and 100 mol of titanium (IV) isopropoxide are used per mole of polyalkyleneimine.

6. Process for preparing functionalized polyalkyleneimines according to claim 1, characterized in that an amount of sodium borohydride equal to 50% to 80% (molar) is used relative to the amount of titanium (IV) isopropoxide used.

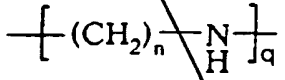
7. Process for preparing functionalized polyalkyleneimines according to claim 1, characterized in that between 6 mol and 100 mol of functionalized hemiacetal are used per mole of polyalkyleneimine.

8. Process for preparing functionalized polyalkyleneimines according to claim 1, characterized in that the starting polyalkyleneimine has the general formula:



(I)

in which R represents a hydrogen atom or a group of general formula:



(II)

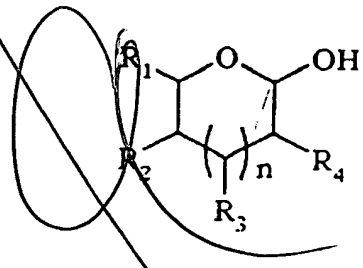
n is an integer between 2 and 10 inclusive,
and p and q are integers, it being understood that the sum p+q is such that the average molecular weight of the polymer is between 100 Da and 10^7 Da inclusive.

9. Process for preparing functionalized polyalkyleneimines according to claim 8, characterized in that said starting polyalkyleneimine is polyethyleneimine (PEI) or polypropyleneimine (PPI).

10. Process for preparing functionalized polyalkyleneimines according to claim 9, characterized

in that said starting polyalkyleneimine is chosen from the polyethyleneimine of average molecular weight 50,000 Da or 25,000 Da or 22,000 Da or the polypropyleneimine of average molecular weight 800,000 Da.

11. Process for preparing functionalized polyalkyleneimines according to claim 1, characterized in that the functionalized hemiacetal has the general formula:



in which n is equal to 0 or 1, and R_1, R_2, R_3 and R_4 are identical or different and represent, independently of each other, a hydrogen atom, a group which is compatible with the reaction carried out or a targeting element, it being understood that one and only one of the substituents R_1, R_2, R_3 and R_4 is a targeting element.

12. Process for preparing functionalized polyalkyleneimines according to claim 11, characterized in that said compatible group is chosen from hydroxyls, alkyls containing 1 to 4 carbon atoms (1 to 4 C) or hydroxyalkyls (1 to 4 C).

13. Process for preparing functionalized polyalkyleneimines according to claim 11, characterized in that said targeting element is chosen from sugars, peptides, proteins, oligonucleotides, lipids, neuromediators, hormones and vitamins, or derivatives thereof.

14. Process for preparing functionalized polyalkyleneimines according to claim 13, characterized in that said targeting element is chosen from growth factor receptor ligands, cytokine receptor ligands, cellular lectin receptor ligands, ligands of RGD sequence with an affinity for the receptors of adhesion proteins such as the integrins, transferrin receptors, HDLs, LDLs, the folate transporter, Sialyl Lewis X, antibody fragments Fab, single-chain antibodies (ScFv) and mono-, di- or trisaccharides.

15. Process for preparing functionalized polyalkyleneimines according to claim 14, characterized in that said saccharide is chosen from galactose, mannose, fucose, rhamnose, lactose and maltose.

16. Process for preparing functionalized polyalkyleneimines according to claim 1, characterized in that the percentage of functionalized hemiacetals grafted onto the polyalkyleneimine is between 1% and 20%.

17. Composition comprising at least one functionalized polyalkyleneimine obtained by the

process according to claim 1 and at least one nucleic acid.

18. Composition according to claim 17, characterized in that said nucleic acid is a deoxyribonucleic acid or a ribonucleic acid.

19. Composition according to claim 18, characterized in that said nucleic acid comprises one or more genes of therapeutic interest under the control of regulatory sequences.

20. Use of a composition according to claim 17 for the preparation of a medicinal product intended for transfecting cells.

21. Use of a composition according to claim 17 for transferring nucleic acids into cells.

22. Method for transferring nucleic acids into cells, comprising the following steps:

(1) forming a composition as defined in claim 17, and

(2) placing the cells in contact with the composition formed in (1).

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